experimental data.

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PHASE I BOOK EXPLOITATION SOV/3520

Presnyakov, Aleksandr Aleksandrovich

Plastichnost' metallicheskikh splavov (Plasticity of Metal Alloys)
Alma-Ata, Izd-vo AN KazSSR, 1959. 209 p. 1,700 copies printed.

Sponsoring Agency: Akademiya nauk Kazakhskoy SSR. Institut yadernoy fiziki.

Eds.: L. N. Moskvicheva, and K. Kh. Barlybayeva; Tech. Ed.: Z. P. Rorokina.

PURPOSE: This book is intended for members of scientific research institutes and engineers at plants engaged in metal-forming processes.

COVERAGE: Information obtained from various sources on the plasticity of metals and alloys is reviewed and summarized. The plasticity of aluminum, nickel, brass, bronze, copper, carbon steel and alloys of different systems is analyzed and illustrated by diagrams. Results of testing plasticity and strength of alloys and solid solutions are discussed, and the dependence of the strength of alloys on temperature and composition is investigated. Changes in properties caused by aging of certain types of bronze are discussed, together with results of the study of deformations with the aid of X-rays and microscopes.

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Plasticity of Metal (Cont.)

Results of experiments are discussed in detail, and basic conclusions drawn from the investigations are explained. No personalities are mentioned. There are 261 references, of which 213 are Soviet and the rest are English, French, and German.

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5-5-60

SOV/180-59-1-14/29

AUTHORS: Presnyakov, A.A. and Starikova, G.V. (Alma-Ata)

TITLE: Conditions for the Appearance of Super-Plasticity in Cast Eutectics (Ob usloviyakh vozniknoveniya sverkh-plastichnosti v litykh evtektikakh)

PERIODICAL: *Izvestiya Akademii nauk SSSR*, Otdeleniye tekhnicheskikh nauk, Metallurgiya i toplivo, 1959, Nr 1, pp 75-77 + 1 *plate (USSR)*

ABSTRACT: Presnyakov and Chervyakova have described (Ref 1) and investigated (Ref 2) the effect of super-plasticity in Al-Cu eutectic rapidly cooled during crystallization. In the present article the authors describe work on the systems Al-Si (11.7% Si), Al-Ni (5.7% Ni) and Al-Fe (1.9% Fe) with the object of elucidating this effect in cast iron eutectics. Grade A1 aluminium, grade Kr-1 silicon, N00-grade nickel and low-carbon steel were used. The alloys were superheated by 150-200°C before pouring into graphite and metal moulds. 5 X 20 mm working-section test-pieces were cut from the ingots. Plasticity in tension was determined at every 100°C, except near the eutectic temperature when the interval was reduced to 20°C. Heating time was 20 minutes. The

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Conditions for the Appearance of Super-Plasticity in Cast Eutectics

results are shown in Figs 1, 8 and 9 fur the silicon, nickel and iron alloys, respectively, as curves of percentage elongation (curves 1,3) and percentage contraction in cross-sectional area (curves 2,4) against temperature (%). The lattice parameters were measured by the X-ray back-reflection method for specimens cast into a metal mould, a graphite mould and in the deformed and annealed states. Figs 2, 6 and 7 show the X-ray patterns obtained after hot deformation and annealing (a) and after quenching from the liquid state (б); Figs 3, 4 and 5 show the corresponding microstructures. The authors conclude that for super-plasticity to appear at temperatures near that of the eutectic transformation a certain degree of metastability must be present. The super-plasticity effect can become very pronounced only when a considerable number of atoms of the second component participate in the atomic movement during the

Conditions for the Appearance of Super-Plasticity in Cast Eutectics

decomposition of the metastable state in the deformation process. The appearance of the effect also depends on the influence of temperature on the solubility of the second component in the solid solution (as suggested by Bochvar, Ref 4).

Card 3/3 There are 9 figures, 1 table and 4 Soviet references.

SUBMITTED: June 16, 1958

PRESNYAKOV, A.A.; CHERVYAKOVA, V.V.

Plasticity of some aluminum alloys. Trudy Inst. iad. fiz. AN Kazakh. SSR 2:3-29 '59. (MIRA 13:3)
(Aluminum alloys) (Plasticity)

PRESNYAKOV, A.A.; CHERVYAKOVA, V.V.

Superplasticity of alloys. Trudy Inst. iad. fiz. AN Kazakh. SSR 2:30-40 '59. (MIRA 13:3)
(Alloys) (Plasticity)

PRESNYAKOV, A.A.; NOVIKOV, A.V.

Investigation of the mechanical properties of tin bronzes with small amounts of zinc, phosphorus, lead, and nickel. Trudy Inst. iad. AN Kazakh. SSR 2:41-73 '59. (MIRA 13:3)
(Bronze)

PRESNYAKOV, A.A.; DUYSEMALIYEV, U.K.

Plasticity of some copper-nickel alloys under dynamic load conditions. Trudy Inst. fiz. AN Kazakh. SSR 2:74-77 '59. (MIRA 13:3)

(Copper-nickel alloys)

PRESNYAKOV, A.A.; SAKHAROVA, N.S.

Investigation of some tin alloys. Trudy Inst. iad. fiz. AN Kazakh. SSR 2:78-84 '59. (MIRA 13:3)
(Tin alloys)

PRESNYAKOV, A.A.; KLYUCHNIKOV, Yu.F.

Fine crystal structure and properties of alloys of nonferrous metals. Trudy Inst. iad. fiz. AN Kazakh. SSR 2:85-94 '59.
(MIRA 13:3)
(Nonferrous alloys)

PRESNYAKOV, A.A.

Causes for decreased plasticity of solid solutions. Trudy Inst. iad. fiz. AN Kazakh. SSR 2:95-100 '59. (MIRA 13:3)
(Solutions, Solid)

PRESNYAKOV, A.A.

Relationship of plasticity to microstructure and to phase state in alloys. Trudy Inst. iad. fiz. AN Kazakh. SSR 2:101-108 '59. (MIRA 13:3)

(Alloys)

PRESNYAKOV, A.A.; BUKIN, V.V.; MIRONENKO , Yu.P.

Determination of average specific pressures in hot rolling of nonferrous metals and alloys. Trudy Inst. ind. fiz. AN Kazakh. SSR 2:129-138 '59. (MIRA 13:3)
(Rolling (Metalwork))

PRESNYAKOV, A.A.

Characteristics of plastic friction. Trudy Inst. iad. fiz. AN Kazakh. SSR 2:139-145 '59. (MIRA 13:3)
(Friction) (Deformations (Mechanics))

PRESNYAKOV, A.A.; SAKHAROVA, N.S.

Structure of zinc alloys. Trudy Inst. iad. fiz. AN Kazakh. SSR 2:146-150 '59. (MIRA 13:3)
(Zinc alloys--Metallography)

5(2) SOV/78-4-8-36/43

AUTHORS: Presnyakov, A. A., Dautova, L. I., Klyuchnikov, Yu. F.

TITLE: On Some Characteristic Features of the Change of the Microhardness and the Crystal Structure of Brass Alloys (O nekotorykh osobennostyakh izmeneniya mikrotverdosti i kristallicheskoy struktury latuney)

PERIODICAL: Zhurnal neorganicheskoy khimii, 1959, Vol. 4, Nr 8, pp 1926-1927 (USSR)

ABSTRACT: Publications contain data on the anomalous changes of the properties of brass alloys in dependence on the composition and temperature (Refs 1,2,5). For this reason the author investigated the crystal structure and the micro-hardness of the brass alloys in cast state and after different thermal processing such as annealing, tempering. The following may be concluded from the results (Figs. 1,2): the maximum of the curve of microhardness of cast samples indicates transformations in solid state. The considerable decrease of the microhardness after the annealing in alloys containing more than 25% zinc inicates a "hardening" in the liquid. After deformation and annealing a regulation under the formation of a two-phase

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On Some Characteristic Features of the Change of the Microhardness and the Crystal Structure of Brass Alloys

mixture takes place in the alloys. Annealing at 800° with subsequent cooling leads to the fixation of the high-temperature state of brass alloys. Figure 3 shows the parameters of the crystal lattices. The strong scattering confirms the existence of a heterogeneity of second order in the solid solutions. In the alloys L95 - L80 the steady course of the parameters is disturbed between 200-300°. This range of disturbation agrees well with the temperature of regulation found by W. Koester and W. Schule (Ref 5). There are 4 figures and 6 references, 4 of which are Soviet.

SUBMITTED: December 18, 1958

PRESNYAKOV, A.A.

Possibility of calculating admissible reductions in one pass on the basis of plasticity indices. Obr. met. davl. no.5:47-52 '59. (MIRA 13:3)

1. Fiziko-tekhnicheskiy institut AN KazSSR.
(Rolling (Metalwork)) (Plasticity)

SOV/136-59-6-15/24

AUTHORS: Novikov, A.V. and Presnyakov, A.A.

TITLE: The Ageing of Bronzes BrOF6.5-0.15 and BrOTsS4-4-2.5 (O starenii bronz BrOF6.5-0.15 i BrOTsS4-4-2.5)

PERIODICAL: Tsvetnyye metally, 1959, Nr 6, pp 79 - 83 (USSR)

ABSTRACT: There are many difficulties in rolling tin-phosphorus and tin-zinc-lead bronzes. The main cause of the high scrap is cracking of the ingots. The two bronzes were investigated by casting into moulds of cast iron, copper and water-cooled copper. Cracking normally occurs after the first or second roll on the bottom and edges of the ingots giving a characteristic parabolic boundary between the cracked and non-cracked parts (Figure 1). Figure 2 shows the plastic deformation of BrOTsS4-4-2.5 with different degrees of deformation. The highest plasticity is shown initially by the metal from the water-cooled mould. With greater degrees of deformation copper and then cast-iron moulds give better results. This is connected with the greater degree of ageing during deformation of the more sharply cooled metal. Figure 3 shows the influence of the degree of deformation on cold-worked and annealed samples. The

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The Ageing of Bronzes BrOF6.5-0.15 and BrOTsS4-4-2.5

highest plasticity is shown by the metal from the cast-iron mould. The plasticity of the metal from the water-cooled copper mould decreases sharply with increase in the degree of preliminary deformation. Figure 4 shows that annealing decreases the hardness in the interval 500-800 °C. Figure 5 shows the mechanical properties of the bronze BrOTsS4-4-2.5 during production, which confirms the above results. It is interesting to note that cracking is observed during the first and second rolls only which confirms the theory that it is connected with ageing. The two bronzes BrOF6.5-0.15 and BrOTsS4-4-2.5 were homogenised at 700 °C for 48 hours and quenched in water. Samples were aged at 200 °C, some for one hour and some for 72 hours and then deformed by rolling. Specimens were prepared from the rolled strip and tested on an impact machine. Results are given in Figure 6. For BrOTsS4-4-2.5 the highest plasticity is shown in the quenched condition. For BrOF6.5-0.15 the samples aged for one hour have very small

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The Ageing of Bronzes BrOF6.5-0.15 and BrOTsS4-4-2.5

plasticity. After ageing for 72 hours the properties are fully recovered. Ageing BrOTsS4-4-2.5 results in a decrease in plasticity. Thus, the rate of precipitation in BrOF6.5-0.15 is much higher than in BrOTsS4-4-2.5. There are 6 figures and 4 Soviet references.

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18.8200
18.1210

SOV/126-8-1-16/25

AUTHORS: Presnyakov, A.A. and Chervyakova, V.V.

TITLE: On the Question of "Super-Plasticity" of Alloys

PERIODICAL: Fizika metallov i metallovedeniye, 1959, Vol 8, Nr 1, pp 114-121 (USSR)

ABSTRACT: In the present paper a few data on super-plasticity obtained as a result of systematic study of the influence of temperature on the plasticity of aluminium alloys are given. The effect of super-plasticity was first noticed by the authors in a cast eutectic Al-Cu alloy (33% Cu), when it was statically strained at 500°C and above (Ref 5). Testing this alloy in its homogenized and quenched condition, as also cast specimens under dynamic loading conditions, did not bring to light any signs of this effect. The photomicrographs of the eutectic alloy shown in Figs 1 and 2 give an idea of the coarse structure of the cast eutectic, which is characterized by a needle-like structure of plates which are elongated towards the centre of the billet (Fig 1a) and of the finely crystalline even structure of the same alloy after homogenization (Fig 2). In order to expose the nature of the microfracture at the moment of deformation when

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On the Question of "Super-Plasticity" of Alloys

the alloy exhibits super-plasticity, a microsection of the cast billet was heated to 525°C, soaked at this temperature for 15 minutes and quenched. As a result of such treatment the needle-like grains have lost their distinct cast shape and texture in isolated places (Fig 1b), although the general nature of the coarse structure has remained unchanged. It must be noted that subsequent polishing of this section for 3-5 minutes has strongly changed the microstructure of the alloy (Fig 1, б-г). A partial decomposition has occurred: a precipitate of the secondary phase can be seen along the boundaries of the needle-like grains. In some places the boundaries of the former needles can be seen (Fig 1б) and in others (Fig 1г), where even before polishing the cast orientation had disappeared on heating, no traces of the former coarse structure have remained. The photomicrograph in Fig 3a is characteristic of the structure of the same alloy after straining at 525°C (one of the temperatures at which super-plasticity has been observed). The highly dispersed, very even structure gives an idea of the deep changes in the structure of the alloy which have occurred during the deformation process. The microstructure of the

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homogenized eutectic, as also of the quenched one, has remained completely unaltered after deformation (Fig 2a), and the plasticity has not exceeded the usual values (Ref 5). In Fig 4a the microstructure of the Al-Cu eutectic cast on a polished surface (without polishing and etching) is shown. Fig 4b is an X-ray photograph of the cast Al-Cu eutectic. In the study of the Al-Zn system, alloys were tested, the zinc content of which is given in the table on p 116. The method used for the preparation and testing of Al-Zn specimens was the same as that for Al-Cu alloys. The following heat treatment was adopted: homogenization at 400°C (except alloys 82-95) for 168 hours. The alloys 82-95 were soaked for the same length of time at 360°C. Quenching was carried out from 400, 375 and 300°C (2 hours' soaking) in iced water. Alloys containing from 71-88% zinc, tested in the quenched condition, were found to be super-plastic. In Fig 5 isotherms of plasticity of Al-Zn alloys in relation to the zinc concentration, tested as quenched from 375°C, are shown. Fig 6a shows the microstructure of an Al-Zn

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alloy containing 80% Zn and quenched from 375°C; Fig 6b is the microstructure of the same alloy heated (after quenching from 375°C) to 250°C and soaked at that temperature for 15 minutes; and Fig 6B is the microstructure of the same alloy after deformation at 250°C in the as-quenched condition, etched in 20% NaOH solution. In Fig 7 the change in strength in relation to temperature of a few alloys of the Al-Zn system, tested in the quenched condition, is shown: 1 - 71% Zn; 2 - 76% Zn; 3 - 80% Zn. The results of the investigation of the systems Al-Cu and Al-Zn have shown that the conditions necessary for a super-plastic state to arise are metastability in the whole mass of crystallites of the investigated alloy, and a deformation rate equal to the rate of their decomposition at sufficiently high temperatures to ensure the required atomic mobility. Data on super-plasticity obtained by the authors as a result of their systematic investigation of aluminium alloys lead to the conclusion that this phenomenon is associated with a condition of the crystal lattice of the alloy and definite processes within it occurring as

On the Question of "Super-Plasticity" of Alloys

a result of temperature changes and stress applications. There are 7 figures, 1 table and 14 references, 9 of which are Soviet, 4 German and 1 English.

ASSOCIATION: Akademiya nauk Kazakhskoy SSR
(Academy of Sciences of the Kazakh SSR)

SUBMITTED: July 30, 1957 (Initially)
May 25, 1958 (After revision)

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18.7500, 18.1200

66228

SOV/126-8-3-11/33

AUTHORS: Presnyakov, A.A., Dautova, L.I. and Klyuchnikov, Yu.F.

TITLE: Homogeneous Ageing of Unsaturated Solid Solutions

PERIODICAL: Fizika metallov i metallovedeniye, 1959, Vol 8, Nr 3, pp 394-399 (USSR)

ABSTRACT: The following simple brasses were investigated: L95, L90, L85, L80, L75, L70, L65 and L60; and the following aluminium bronzes: Br.A1, A2, A3, A4, A5, A6, A7, A8, A9 and A10. All the above alloys were made from copper, M0, aluminium A00 and zinc TsV. The alloys were prepared for X-ray investigation as follows: rods of 18 mm diameter and 120 mm length were cast and forged (initial forging temperature 800°C) to a degree of deformation of approximately 30%. From the forged rods cylindrical "tumblers" were cut. The thickness of their base was 1.5 to 2 mm and their external surface (used for X-ray investigation) was ground and polished. The specimens were then annealed in air at 800°C for 6 hours. After annealing, the working surface was ground, polished and etched with nitric acid in order to remove the work-hardened layer. X-ray pictures were taken using a Cu-K_α irradiation. In the X-ray pictures, the interference spots

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Homogeneous Ageing of Unsaturated Solid Solutions

from the planes (420) and (331) were fixed by an exposure of 45 minutes. The specimen was placed in the electric furnace and remained immobile during exposure. It was heated to 20, 100, 200, 250, 300, 350, 400, 450 and 500°C and the temperature was regulated within 10 to 20°. In Fig 1, X-ray photographs of solid solutions are shown: a - L80, first X-ray exposure after annealing; б - L80, repeated X-ray exposure after storage; в - Br A5, first X-ray exposure after annealing; г - Br A5, repeated X-ray exposure after storage. In Fig 2, X-ray pictures of alloys with "incomplete recrystallization" are shown: a - L90; б - Br A2. Fig 3 shows X-ray pictures of brass specimens quenched from 800°C in water after annealing for 6 hours: a - brass L70, immediately after quenching; б - brass L90, after quenching and ageing. Fig 4 shows "recrystallization" after ageing of the alloy Br A2 (400°C). The authors arrived at the following conclusions: (1) Homogenization ageing in unsaturated solid solutions has been observed. This is not accompanied by a change in the phase composition of the alloy or by precipitation of excess

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Homogeneous Ageing of Unsaturated Solid Solutions

phases. It results in a very great refining of the mosaic-block structure and the disorientation of the mosaic blocks relative to each other. (2) The occurrence of ageing in solid solutions having undergone hot deformation and subsequent annealing testifies to the "quenching" of the high temperature state of the crystal structure of the alloy on slow cooling. (3) The refinement of the blocks during the ageing process and their recrystallization at elevated temperatures shows that for various temperature conditions equilibrium mosaic structures exist, towards which the alloy tends under all conditions, including that of room temperature. (4) The "ageing" process of solid solutions is reversible. The rate at which the reverse process occurs will be greater, the greater the rate of the direct process. (5) The homogeneous ageing process is preceded by the closest ordering of solid solutions. This seems to explain the low rate at which it takes place. There are 4 figures, 1 table and 16 references, 15 of which are Soviet and 1 German.

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66228

SOV/126-8-3-11/33

Homogeneous Ageing of Unsaturated Solid Solutions

ASSOCIATION: Institut yadernoy fiziki AN KazSSR (Institute of Nuclear Physics AS KazSSR)

SUBMITTED: August 26, 1958 (initially)
November 27, 1958 (after revision)

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SOV/32-25-4-48/71

25(2)
AUTHORS: Presnyakov, A. A., Vinnitskiy, A. A.

TITLE: Device With a Two-part Bolt for Determining the Coefficient of Outside Friction (Pribor s razreznym boykom dlya opredeleniya koeffitsiyenta vneshnego treniya)

PERIODICAL: Zavodskaya Laboratoriya, 1959, Vol 25, Nr 4, p 487 (USSR)

ABSTRACT: A device was designed (Figure) which makes it possible to determine the contact frictional forces acting in the immersion, as well as the true specific pressure on the contact surface. The latter permits the distribution of friction in the place of deformation to be studied, and the frictional coefficient to be computed. The lower bolt of the device consists of two halves - one stable and the other movable. The pressure exerted on the bolt by an immersion is transmitted from the movable half by a screw to a dynamometer, and so the force is recorded. To determine the true specific pressure, a second dynamometer with angle feelers (ugol'nyy datchik) of the system by G. I. Aleksandrov (Ref 1, according to instructions I15-54 on the measurement with angle feelers of the system by the TsNIITMASh) is used. The latter contains a membrane dynamometer

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Device With a Two-part Bolt for Determining the Coefficient of Outside Friction

on which the load acts by a pin. Preliminary tests showed that the friction coefficient is about 0.1 for copper alloys at room temperature. There are 1 figure and 1 Soviet reference.

ASSOCIATION: Institut yadernoy fiziki Akademii nauk Kazakhskoy SSR (Institute of Nuclear Physics of the Academy of Sciences of the Kazakhskaya SSR)

18.8200
18.1220

S/180/60/000/01/017/027
E193/E135

AUTHORS: Presnyakov, A.A., and Starikova, G.V. (Alma-Ata.

TITLE: On the Anomalous Increase in the Ductility of (α+β)-Brasses

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Metallurgiya i toplivo, 1960, Nr 1, pp 123-126 (USSR)

ABSTRACT: The anomalous increase in the ductility of two-phase alloys in the phase transformation range has been observed and studied by many workers. However, there is no agreement in the interpretation of the experimental data and it was for this reason that the present investigation was undertaken. The experimental materials comprised brasses L-62, LS59-1, and L52 (β-brass). The elongation of the specimens, tested under static tensile stress, was taken as the criterion of the ductility of the alloys, this characteristic being most convenient for studying the "super-ductility" phenomena. The results of the first series of experiments are reproduced in Fig 1, where elongation (ε, %) is plotted against temperature (°C) for the L-62 and LS59-1 alloys (curves 1 and 2, respectively). The results of similar experiments, carried out on brass L-52, are given in Fig 2 where

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U.T.S. (σ_B, kg/mm^2) and ε are plotted against temperature (curves 2 and 1, respectively). The rate of heating during these experiments was approximately 16 °C/min. Although the LS59-1 brass contains 1% Pb, the maximum value of ε (180%) was practically the same for both L-62 and LS59-1 alloys; this value was attained at 870 °C in the former and at 770 °C in the latter alloy. Intercrystalline cracks appeared in the L-62 brass at 900 °C owing to the nearness of the melting point (903°C) but at other temperatures the specimens deformed normally and no symptoms of "burning" were observed. In the case of brass L-52, a sharp increase in ε was observed at 470-480 °C. This effect is attributed to the diffusion mechanism of the order-disorder transformation which, on heating, takes place in the β-brass at about 470 °C. The maximum value of ε, attained at 570-600 °C, can hardly be associated with the order-disorder transformation and it has been attributed by the present authors to some other factor of, as yet, unknown nature. The present authors have postulated that the anomalous increase in ε of the two-phase alloys is associated

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On the Anomalous Increase in the Ductility of (α+β)-Brasses

with the α → β transformation. This hypothesis was confirmed by the results of isothermal tests which are reproduced in Fig 3, where ε is plotted against time (t, min) at the test temperature for brass L-62, tested at 870 °C (curve 1) and brass LS59-1, tested at 725-740 °C (curves 2 and 3, respectively). ε decreased with increasing time at a given temperature, the rate of this decrease being accelerated by raising the test temperatures. Thus, in the first approximation, the anomalous increase in ε is proportional to the quantity of the α-phase still undergoing the α → β transformation. This conclusion has been confirmed by the results of microscopic examination of specimens of the brass LS59-1 after various treatments. The various structures, shown in Fig 4 (X 200), relate to: a - specimen heated to 770 °C and immediately quenched; b - the same specimen, deformed immediately after reaching 770 °C and quenched; B - specimen quenched after being held for 2 min at 770 °C; 2 - the same specimen, deformed after 2 min at 770 °C and quenched; d - specimen quenched after 5 min at 770 °C.

On the Anomalous Increase in the Ductility of (α+β)-Brasses

It will be seen that at the moment of reaching 770 °C and after 2 min at this temperature, the alloy is still heterogeneous (Figs 4a, b); after 5 min at 770 °C, the alloy consists of β-phase only (Fig 4d). At the same time specimens, tested to rupture immediately on reaching 770 °C, or after 2 min at this temperature (i.e. at the moment when they still consisted of two phases) and then quenched, were found to consist (in the near-fracture region) of one phase only (Figs 4b and 2). The ductility of these specimens was higher than that of specimens which, at the moment of testing, consisted of one phase only ($\varepsilon_{\alpha+\beta} = 170\%$, $\varepsilon_{\beta} = 100\%$). Several conclusions were reached. (1) The anomalous increase in the elongation of specimens of (α+β)-brasses, tested in tension at temperatures above 700 °C, is associated with the $\alpha \rightarrow \beta$ phase transformation; the maximum increase in ductility of these brasses corresponds to the temperature at which the intensity of the $\alpha \rightarrow \beta$ transformation is at its highest. (2) The connection between the decomposition of the α-phase and the anomalous ductility effect has been

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On the Anomalous Increase in the Ductility of (α+β)-Brasses

confirmed by the variation in ductility of specimens subjected to isothermal treatment; the longer the soaking time at the given temperature, the lower is the elongation as a result of the alloy approaching more closely the state of equilibrium. For the same reason, ductility decreases with increasing temperature of the isothermal treatment. (3) Rapid increase in ductility of brass L-52, at 470-480 °C, is associated with the order-disorder transformation taking place in the alloy in this temperature range.

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There are 4 figures and 10 references, of which 9 are Soviet and 1 is German.

SUBMITTED: October 13, 1959

80985

S/180/60/000/03/017/030

E193/E383

IP 1210

AUTHORS: Presnyakov, A.A. and Chervyakova, V.V. (Alma-Ata)

TITLE: On Super-ductility of the Aluminium-Zinc Alloys of the Eutectoid Composition

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Metallurgiya i toplivo, 1960, Nr 3, pp 92 - 98 + 1 plate (USSR)

ABSTRACT: The present paper describes the results of a systematic study of the effect of the composition and thermal history of the aluminium-zinc alloys on their ductility at various temperatures. Maximum ductility was observed in the 80% Zn-Al alloy, quenched from 400 °C and tested at 275 °C; elongation of 628% was obtained in this case, with the test piece still unbroken owing to the limitations imposed by the dimensions of the testing equipment. No super-ductility was observed in test pieces, quenched from temperatures below 275 °C or tested at temperatures above the temperature of the eutectoid transformation. Only alloys containing between 71.6 and 88.0% Zn were capable of displaying super-ductility and although the effect was observed in specimens quenched from any temperature above 275 °C, the higher the quenching temperature the higher

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On Super-ductility of the Aluminium-zinc Alloys of the Eutectoid Composition

was the degree of super-ductility. The variation of strength of the quenched specimens in the super-ductile condition differed considerably from that of other alloys of the system. In the moment immediately preceding the onset of super-ductility, the load carried by the test piece was small but measurable; further deformation of the specimen took place under a load so small that it could not be measured by the equipment employed in the experiments. The results of X-ray diffraction analysis of a series of Zn-Al alloys, subjected to various heat treatments, showed that the onset of super-ductility is accompanied by far-reaching changes in the crystal lattice. The character of these changes correlated with the results of microhardness measurements and theoretical considerations led the present authors to the conclusion that the process of stabilization of the metastable structure formed as a result of spontaneous decomposition of the β_2 solid solution play a predominant part in the phenomenon of

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super-ductility, observed in the Zn-Al alloys. This view is supported by the following facts: 1 - no super-ductility is displayed in the absence of metastable condition, associated with the eutectoid transformation, i.e. in the alloys quenched from below 275 °C; 2 - no super-ductility is observed in specimens quenched from temperatures higher than 275 °C and tested at temperatures above 300 °C; 3 - the degree of super-ductility increases with rising quenching temperature, this effect being obviously associated with the higher degree of metastability and consequently with a higher intensity of the diffusion processes; 4 - the phenomenon of super-ductility is not observed in homogeneous alloys that have attained the state of equilibrium; 5 - the degree of super-ductility depends on the quantity of the phase taking part in the stabilizing processes; the alloys of the eutectoid and near-eutectoid composition consist almost exclusively of such an "active" material; the further away from the eutectoid is the composition of an alloy, the larger proportion of the "inert"

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S/180/60/000/03/017/030
E193/E383

On Super-ductility of the Aluminium-zinc Alloys of the Eutectoid Composition

material it contains and when a certain critical content of the inert material is reached, the alloy loses its super-ductile properties. Since super-ductility in certain Al-Zn alloys is associated with the condition of and the phenomena taking place in the crystal lattice at elevated temperatures in the presence of externally applied stresses it must be concluded that not only the boundary regions of the interacting phases but the whole volume of the crystal takes place in the processes associated with super-ductility. There are 5 figures, 2 tables and 17 references, 11 of which are Soviet, 4 German and 2 English.

SUBMITTED: March 2, 1959

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S/136/60/000/011/011/013
E193/E483

AUTHORS: Presnyakov, A.A., Duysemaliyev, U.K. and Mironenko, Yu.P.

TITLE: On Plasticity of Some Zinc-Base Alloys

PERIODICAL: Tsvetnyye metally, 1960, No.11, pp.76-81

TEXT: The object of the investigation, described in the present paper, was to obtain data on plasticity (as measured by the reduction in area of tensile test pieces) of zinc-rich binary alloys containing 0 - 5.5% Al, 0 - 3.0% Cu, 0 - 3.0% Pb and 0 - 10.0% Cd both in the as-cast and homogenized condition. The test pieces, with the gauge length 5 mm in diameter and 20 mm long, were machined from cast rods. The homogenization treatment consisted of 144 h at 365°C in the case of Zn-Al alloys, and 104 h at 370°C in the case of the Zn-Cu alloys. The tensile tests were carried out at various temperatures covering the 20 to 400°C range. All alloys were subjected to static tensile tests which also provided data on the strength of these alloys; in addition, the Zn-Al and Zn-Cu alloys were tested under dynamic conditions, the rate of strain in this case being of the order of several m/sec. Side by side with the mechanical tests, microhardness measurements and metallographic examination were carried out (by engineer

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E193/E483

On Plasticity of Some Zinc-Base Alloys

N.S.Sakharova). The following conclusions were reached: (1) Unalloyed zinc is characterized by two temperature ranges of high plasticity (150 to 230 and 350 to 400°C) and two brittle ranges (20 to 150 and 230 to 350°C); at temperatures above 400°C, plasticity of zinc rapidly decreases. In this respect, electrolytic zinc differs little from granulated metal, except that the maximum values of plasticity, attained by the latter material, are somewhat higher. (2) The general character of the temperature-dependence of plasticity of zinc is unaffected by the introduction of small quantities of aluminium, copper, lead and cadmium. The position of the first maximum of plasticity changes from 200 to 100°C in the Al- and Cd-bearing alloys and to 125 - 150°C in the Cu- and Pb-bearing materials; the position of the second maximum is practically unaffected by the presence of these alloying additions. (3) With increasing content of the alloying additions studied, the plasticity of zinc decreases in the ranges of high plasticity and remains constant or slightly increases in the brittle temperature ranges. Cadmium reduces plasticity of zinc at all temperatures, its effect being most pronounced within the plastic

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On Plasticity of Some Zinc-Base Alloys

temperature ranges. (4) Plasticity of Zn-Al alloys containing up to 0.25% Al is higher than that of pure zinc. (5) On changing the conditions of testing from static to dynamic, plasticity of zinc and Zn-Al alloys sharply increases and the second brittle range is, in the case of zinc, shifted towards the lower temperatures. no such effect has been observed in the Zn-Cu alloys. (6) Prolonged homogenization treatment brings about a considerable increase in plasticity of the Zn-Cu and Zn-Al allcys. The first plastic temperature range becomes wider at the expense of the second brittle range, plasticity in the second brittle range increases and the second plastic temperature range becomes less well defined. (7) The temperature dependence of U.T.S. of pure zinc has two maxima, each of which is located in one of the plastic temperature ranges of this material. (8) The temperature dependence of U.T.S. of the Zn-Cu and Zn-Pb alloys has only one maximum in the first plastic temperature range. The corresponding curves for the Zn-Cd alloys have two maxima when the cadmium content is less than 2.0% and only one maximum in the case of alloys with more than 2.0% Cd. (9) U.T.S. of the Zn-Al alloys (both cast and homogenized) decreases

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On Plasticity of Some Zinc-Base Alloys

with rising temperature, passes through a minimum at about 50°C and a maximum at 100°C, after which it gradually decreases again. (10) With increasing alloying content, U.T.S. of zinc generally increases at all temperatures. The Zn-Pb alloys which are subject to liquation effects are an exception to this rule. Also, U.T.S. of the Cd-rich (2 - 10% Cd) alloys at temperatures above 200°C is lower than that of alloys with a lower cadmium content. (11) Hardness of the Zn-Al alloys decreases monotonically with rising temperature. There are 7 figures, 1 table and 10 references: 8 Soviet and 2 German.

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PRESNYAKOV, A.A.

82644

S/126/60/010/02/016/020
E073/E335

18.8200

AUTHORS: Presnyakov, A.A. and Chervyakova, V.V.

TITLE: On the Nature of Plasticity Minima in Solid Solutions

PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol. 10, No. 2, pp 291 - 293

TEXT: On the basis of earlier work (Refs. 1-8), the authors express the view that occurrence of sharp drops (minima) in plasticity are due to diffusion processes which accompany deformations and cause additional distortions and defects, resulting in an increase in strength. The experimental data on plasticity and strength anomalies for a number of brasses are graphed in Figs. 1 and 2. For all these alloys a deviation of the strength indices is observed in the temperature range which corresponds to the plasticity minimum whereby for one of the alloys there is one strength anomaly, whilst in three other alloys two strength anomalies were observed. The point of transition from one anomaly to the other coincides in all cases with the minimum of the drop in plasticity. It is obvious that this coincidence is not accidental. The anomalous change in the strength in this range

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On the Nature of Plasticity Minima in Solid Solutions

is between 4 and 5 kg/mm^2, i.e. about 20-30% of the measured value, which is considerably greater than possible experimental errors. The authors consider that the experimental results fully confirm their earlier expressed theoretical views. They believe that further experiments will be necessary to elucidate fully the obtained experimental results..
There are 2 figures and 9 Soviet references.

ASSOCIATION: Institut yadernoy fiziki AN KazSSR
(Institute of Nuclear Physics of the Ac.Sc. KazSSR)

SUBMITTED: March 19, 1960

PRESNYAKOV, A.A.

Concerning an article by B.IA. Pines and E.F. Chaikovskii. Fiz. met. i metalloved. 10 no.2:320 Ag '60. (MIRA 13:9)

1. Institut yadernoy fiziki AN KazSSR.
(Diffusion) (Sulfur)
(Pines, B.IA.) (Chaikovskii, E.F.)

S/126/60/010/005/007/030
E073/E435

AUTHORS: Presnyakov, A.A., Dautova, L.I. and Klyuchnikov, Yu.F.

TITLE: On Anomalies in the Electric Resistance of Brasses and Aluminium Bronzes

PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol.10, No.5, pp.676-680

TEXT: Earlier work (Ref.10) related to phenomen of homogeneous ageing of unsaturated solid solutions and also (Ref.11) to investigation of the changes in the crystal structure of brasses with temperature and microhardness after various heat treatments. Particularly, the anomalous temperature dependence of the crystal lattice parameter of the brass in the temperature range 200 to 300°C was observed when an increase in temperature did not result in an increase of this parameter but in constancy or even a decrease. This fact, and alsc the character of the microhardness changes with temperature, led to the conclusion that ordering takes place in Cu-Zn α-solutions and particularly that ordering also explains the homogeneous ageing. In this paper, a continuation of this work is described which was devoted to investigating the kinetics of the process of ordering of α-solutions of Cu-Zn and

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On Anomalies in the Electric Resistance of Brasses and Aluminium Bronzes

Cu-Al. Alloys containing 5, 10, 15, 20, 25, 30 and 38% Zn and 1, 2, 3, 4, 5 and 6% Al were investigated, determining the dependence of the specific resistance on temperature and duration of tempering of quenched specimens. The brass specimens were in the form of 2 mm diameter wires and the Al bronze specimens were in the form of 1 x 10 x 200 mm strips. The wire (500 mm long) was wound into a spiral. Twin copper conductors were welded on, by arc welding, to the ends of the spirals and the strips for the purpose of connection to the supply and potentiometric terminals of the bridge; this enabled carrying out heat treatment without it being necessary to re-solder the leads. The resistance was measured with a double Thomson-Wheatstone bridge of an accuracy of 0.05%. For eliminating oxidation during heat treatment, the specimens were coated with a layer of liquid glass. Quenching was in iced water after soaking for 45 min at 800°C. The quenched specimens were subjected to tempering at 100, 200, 300, 400, 500 and 600°C for durations of 10 min to 12 hours, followed by air

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E073/E435

On Anomalies in the Electric Resistance of Brasses and Aluminium Bronzes

cooling. Fig.1 to 4 show the curves of the relative changes in the resistance as a function of temperature and tempering time, taking as 100% the electric resistance of the quenched specimens. Fig.5 gives the dependence of the specific resistance of Cu-Zn alloys on the composition for various states (after 80% deformation, after annealing for 1 hour at 600°C and after quenching from 800°C). The following conclusions are arrived at:

1) Analysis of the changes of the electric resistance of brasses as a function of the tempering temperature confirms the presence in these of the process of ordering.

2) The maximum ordering manifests itself for a Zn content of 10 and 30 wt.%.

3) The process of ordering is preceded by the occurrence of the K-state in the case of long duration annealing of quenched alloys at 200 to 300°C, which then changes into ordinary ordering, the maximum degree of development being achieved at 400°C. Tempering at 500°C and above leads to the formation of a complete disorder

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E073/E435

On Anomalies in the Electric Resistance of Brasses and Aluminium Bronzes

state of the brasses.
4) Occurrence of the K-state and of ordering also occurs in Al bronzes.
There are 5 figures and 14 references: 8 Soviet and 6 Non-Soviet.

ASSOCIATION: Institut yadernoy fiziki AN KazSSR (Institute of Nuclear Physics AS KazSSR)

SUBMITTED: February 20, 1960 (initially)
June 5, 1960 (after revision)

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S/126/60/010/006/022/022
E201/E491

AUTHORS: Starikova, G.V. and Presnyakov, A.A.

TITLE: Change in Mechanical Properties of Nichrome on Formation of the K-State

PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol.10, No.6, pp.943-945

TEXT: The anomalous rise of the electrical resistance on annealing of nichrome after quenching was ascribed by Thomas (Ref.1) to formation of the K-state. The present authors report that the tensile strength of nichrome wire, 3.9 mm in diameter, was not greatly affected by annealing at comparatively low temperatures but a 400 to 500°C anneal raised the strength by 6% compared with the strength of quenched non-annealed nichrome. Annealing at 600 to 700°C lowered the tensile strength again. These changes in the tensile strength were ascribed to formation of the K-state and its subsequent destruction above 500°C. The results obtained are shown in Fig.1 and 2. Fig.1 gives the tensile strength σ_B (in kg/mm^2), contraction ψ, and extension δ as a function of the annealing temperature (0 to 700°C). Fig.2 shows the plot of σ_B and ψ against the

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Change in Mechanical Properties of Nichrome on Formation of the K-State

duration of the 450°C anneal (in minutes). There are 2 figures and 3 references: 2 Soviet and 1 non-Soviet.

ASSOCIATION: Institut yadernoy fiziki AN KazSSR
(Institute of Nuclear Physics AS KazSSR)

SUBMITTED: July 4, 1960

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E201/E491

Change in Mechanical Properties of Nichrome on Formation of the K-State

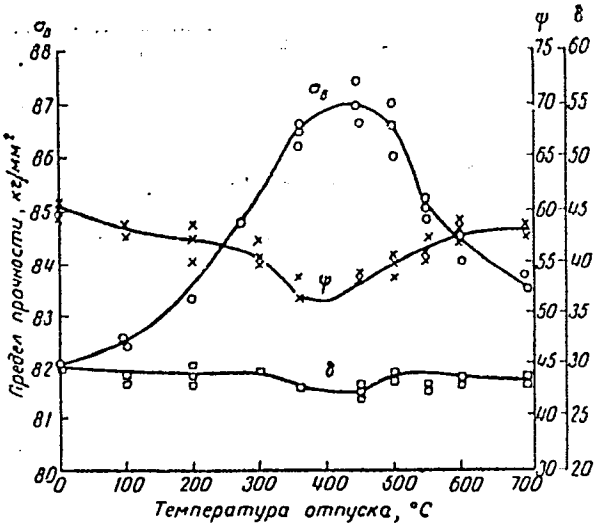

Рис. 1. Изменение предела прочности $\sigma_в$, сужения ψ, удлинения δ нихрома с температурой отпуска.

Fig. 1, p. 944

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E201/E491

Change in Mechanical Properties of Nichrome on Formation of the K-State

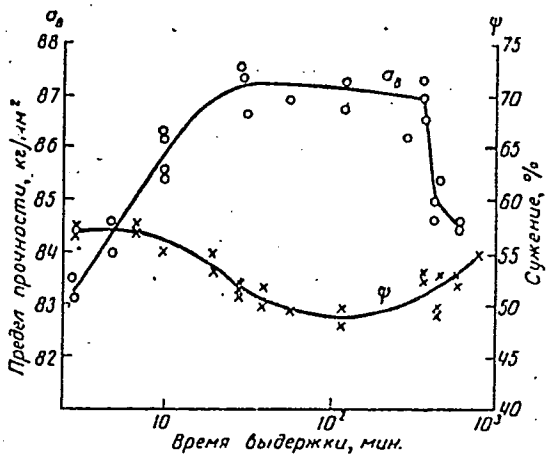

Рис. 2. Изменение предела прочности $\sigma_в$, сужения ψ нихрома со временем выдержки при 450° С.

Fig 2
p 144

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1.9600 also 2807

AUTHORS: Vinnitskiy, A. A. and Presnyakov, A. A.

TITLE: The Experimental Determination of the Coefficient of Friction in Shrinking

PERIODICAL: Zavodskaya laboratoriya, 1960, Vol. 26, No. 12, p. 1405

TEXT: Already previously, the authors (Ref. 1) suggested determining the coefficient of friction by means of a "cutting hammer", which permits studying the change of friction in deforming in various regions of deformation, which is not possible in the case of other methods. For comparison, the coefficients of friction were determined according to the shift method (Ref. 2). The shifting force was recorded by the resistance pickup using an oscilloscope of the type МПО-2 (MPO-2). The oscilloscope showed a maximum on the curve, which corresponds to the instant at which the adhesive friction is overcome. Thus, already the first experiments prove that gliding and adhesion differ. The results of the experiments made to determine the coefficient of external friction are shown in a figure. The rules governing the change in the coefficient of friction, measured by means of both types

The Experimental Determination of the Coefficient of Friction in Shrinking

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B020/B056

of apparatus, are practically the same. The coefficients of friction are near 0.5 at a degree of deformation below 10%, and drop rapidly if the shift method is applied, and less rapidly when using the "cutting hammer" method. With equal degrees of deformation, the coefficients of friction of both alloys are practically the same. If the degree of deformation is increased, the values of the coefficients of friction decrease, and converge to a value somewhat below 0.1. There are 1 figure and 2 Soviet references.

ASSOCIATION: Institut yadernoy fiziki Akademii nauk Kazakhskoy SSR (Institute of Nuclear Physics of the Academy of Sciences Kazakhskaya SSR)

PRESNYAKOV, A.A.; CHERVYAKOVA, V.V.; NOVIKOV, A.V.; KLYUCHNIKOV, Yu.F.

Role of lead in leaded brass. TSvet. met. 33 no.7:77-81 Jl '60.
(Brass--Metallurgy) (Lead)

S/020/60/132/02/24/067
B014/B007

AUTHORS: Presnyakov, A.A., Dautova, L.I.

TITLE: The Anomalies in the Properties of Zinc

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 132, No. 2, pp. 333-335

TEXT: The present paper deals with investigations of the temperature dependence of the structure and properties of zinc. A kind of zinc with 0.01% impurities was investigated which is produced in an electric furnace. In the diagram of Fig. 1 the plasticity, the elongation, and the deformation resistivity of the material at different temperatures is graphically represented. The results of X-ray diffraction studies are graphically represented in Fig. 2. Here it is shown that the change of the lattice constant a is of complicated character with rising temperature. The corresponding curve divides into three branches. The parameter c changes monotonically but with different temperature coefficients within the range up to 120° C, from 120° - 180° C, and beyond 180° C. In all temperature ranges investigated (up to 220° C) the nature of the crystal lattice does not change, but at 120° and 180° C very fine changes

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take place in the lattice. From the fact that at these temperatures no changes of volume, but changes of the coefficient of thermal expansion occur, the authors draw conclusions as to phase transitions of the second kind. This is also indicated by the character of the changes of the electric resistivity in zinc single crystals. The dependence of the electric resistivity on temperature, constructed according to data by Z.N. Rabotnov, is graphically represented in Fig. 3 (Ref. 11). A.F. Plekhanov and M.I. Kognev (Ref. 12) formed the same opinions when analyzing the changes in the properties of zinc. N.V. Ageyev et al. (Ref. 13) are also mentioned; they referred to spin-ordering. There are 3 figures and 13 references, 11 of which are Soviet.

ASSOCIATION: Institut yadernoy fiziki Akademii nauk KazSSR (Institute of Nuclear Physics of the Academy of Sciences, Kazakhskaya SSR)

PRESENTED: January 6, 1960, by I.P. Bardin, Academician

SUBMITTED: January 5, 1960

PRESNYAKOV, A. A.

Doc Tech Sci - (diss) "Anomalies of plasticity observed in metallic alloys." Moscow, 1961. 19 pp; (Ministry of Higher and Secondary Specialist Education RSFSR, Krasnoyarsk Inst of Non-Ferrous Metals imeni M. I. Kalinin); 200 copies; price not given; (KL, 10-61 sup, 212)

PRESNYAKOV, A A

PHASE I BOOK EXPLOITATION SOV/5690

Akademiya nauk Kazakhskoy SSR. Institut yadernoy fiziki.

Metallovedeniye i obrabotka metallov davleniyem (Physical Metallurgy and Pressworking of Metals) Alma-Ata, 1961. 183 p. (Series: Trudy Instituta yadernoy fiziki, t. 4) 2,450 copies printed.

Resp. Eds.: I. G. Grinman and A. A. Presnyakov; Resp. Secretary: V. V. Chervyakova; Eds.: M. Ya. Brailovskaya and T. I. Shevchuk; Tech. Ed.: Z. P. Rorokina.

PURPOSE: This book is intended for scientific research workers, technical personnel in industry, and students and aspirants interested in problems of physical metallurgy and the pressworking of metals.

COVERAGE: The book, Volume IV of the Transactions of the Institute of Nuclear Physics, Academy of Sciences Kazakh SSR, contains papers reviewing problems of physical metallurgy. Attention is given to a consideration of metal ductility, strength, phase transformation, and the ordering of various alloys, and to a discussion of the diffusion mechanism of the plasticity. Experimental findings concerning strength, deformation, and external friction in the working of non-ferrous metals and alloys are included in papers dealing with metal rolling.

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Problems of automatic inspection and control of multidraft wire-drawing frames are also considered. Most of the papers are accompanied by references, the majority of which are Soviet.

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Physical Metallurgy and Pressworking of Metals SOV/5690

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S/031/61/000/002/001/003
A161/A133

18 8200

AUTHOR: Presnyakov, A. A., Candidate of Physics and Mathematics

TITLE: On the causes of anomalous plasticity in metal alloys

PERIODICAL: Vestnik Akademii nauk Kazakhskoy SSR, no. 2, 1961, 27 - 34

TEXT: The institut yadernoy fiziki An KazSSR (Institute of Nuclear Physics As KazSSR) has studied for years the phenomenon of anomalous plastic behaviour (plasticity dip and superplasticity effect) in copper, aluminum, zinc and magnesium base alloys. The plasticity dip, or brittleness zone, that is inherent with most of the engineering alloys in certain temperature ranges had been studied in the USSR by Member of AS BSSR S. I. Gubkin and his school, and the "superplasticity" in certain ranges had been discovered and studied by Member of AS USSR A. A. Bochvar (Ref. 6: "Izvestiya AN SSSR", OTN, 1948, No. 5, and Ref. 7: A. A. Bochvar and Z. A. Sviderskaya, "Izvestiya AN SSSR, OTN, 1945, No. 3). The results of studies at the Institute of Nuclear Physics AS KazSSR are discussed with reference to 28 sources, and a new theory is suggested to explain the different plasticity anomalies. Graphs illustrating the test results are included. As in the example of Al-Cu alloys (Fig. 3), plasticity dips were connected with development of def-

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On the causes of...

inite processes. The first dip was observed in the low temperature range during the most intense aging, i.e., atoms diffusion at the formation of the second phase (intermetallic Al_2Cu), and the dip was clearly connected with transformations, for in homogenized specimens the dip was much less expressed. The second dip in the Al-Cu system at about 300°C coincided with the recrystallization maximum during deformation in tests, and the third dip with a minimum at about 425° was most clear in two-phase alloys and could be observed in the range of intense dissolving of the second phase particles, i. e., the phenomenon again was connected with diffusion. Alloys crystallizing with a hexagonal and dense lattice behaved characteristically, and the addition of the second component in all Zn-Mg compositions displaced the first plasticity maximum toward lower temperature. This was observed with additions of Al, Cu, Pb, Cd to Zn, and of Al, Zn and Cd to Mg. The plasticity maximum shifted by 75 - 100°C. The rate of load application in tests had a considerable effect, and the plasticity dip practically disappeared at definite load rates (this observation had been made also by other authors previously). A higher rupture rate in Al-Cu systems raised by low-temperature plasticity dip by 100°C, and in tin bronzes by 200°C. The behaviour of alloys in different states indicated that plasticity is lowest in cast metal, highest in hardened metal. Dendritic heterogeneity reduced the plasticity, but it is possible that the drop

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On the causes of...

of plasticity was due to dissolution of dendrites in deformation, i.e., again diffusion. The presently accepted opinion that the higher plasticity of alloys in the hardened (metastable) state is due to a deformation in the most plastic solid solution state is wrong, for the highest-alloyed solid solutions are always the least plastic ones. It is apparent that the plasticity rise in this case is due to intense stabilization at rates corresponding to the deformation rate. Facts indicate that the plasticity may be raised by a transformation from the homogeneous metastable to the heterogeneous equilibrium state, provided the transformation rate is fast enough (Ref. 28: Osipov, K. A., "Izvestiya AN SSSR", OTN, 1951, no.6) In general, the experimented data show that the plasticity dips are connected with deep transformations in the crystal lattice of alloys developing by diffusion. As to the superplasticity effect, it was stated that it is not a peculiar feature of Al-Zn eutectic alone. It was found in Al-Cu eutectic that had crystallized at a high rate, and slight traces of it were present in the Al-Si eutectic. Microscopic, X-ray and microhardness analyses showed that the cause of superplasticity is the development of stabilization during the deformation of alloys in the metastable state. Deformation near the solidus is accompanied with intense decomposition, the kinetics of which correspond to the deformation rate. Stabilization is connected with a transfer of atoms from one lattice into the other, and their

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A161/A133

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mobility increases with the weakening bond. This accounts for an abrupt increase of plasticity. It was found that the effect arises only in the case of a high content of the second component in the eutectic, considerable change of its solid solubility, and the possibility of obtaining a considerable metastability at "quenching" of eutectic from liquid. It was observed that decomposition during the hardening of the Al - Zn eutectoid takes place in two stages. The first stage occurs in the process of hardening itself and consists in "re-decomposition" of the β_2 solid solution and the formation of aluminum solution with very little zinc, and zinc solution with very little aluminum. Their lattices are coherently joined. It is reflected in X-ray photographs by very blurred or even vanished back lines. The second decomposition stage at deformation eliminates the "re-decomposition", and the superplasticity effect is due to a diffusion of atoms. In dynamic tests of specimens all anomalities of plasticity disappeared. Thus, studies led to the conclusion that plasticity anomalies are caused primarily by deep transformations in alloy lattices. It is presumed that studies of engineering alloys will provide data for obtaining high engineering properties by preliminarily selected heat and deformation techniques. There are 4 figures and 28 references: 26 Soviet-bloc and 2 non-Soviet-bloc.

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On the causes of...

Figure 1: Variations of plasticity dips in solid solutions with face--centered cubic lattice. a-pure metal, b, c, d-solid solutions with increasing alloy components content (1) - reduction of area,(2) - temperature

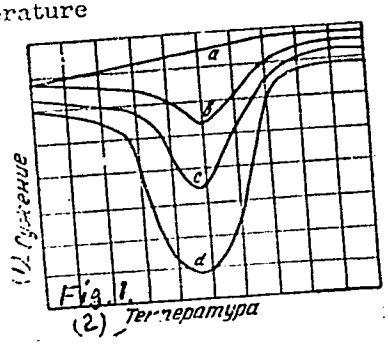

Fig. 1.

Figure 2: Displacement of the dip minimum in Al - Zn systems (1) - temperature °C, (2) - Zn % in alloys

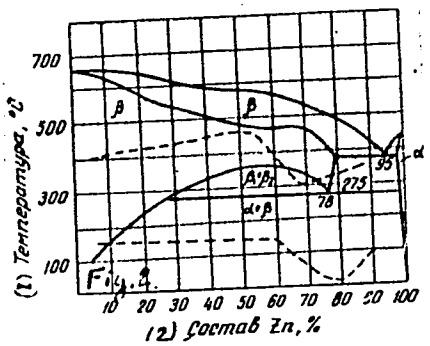

Fig. 2.

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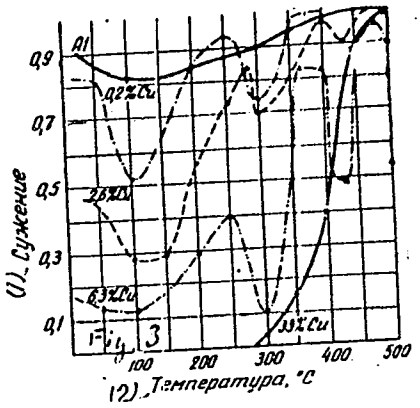
On the causes of...

Figure 3: Plasticity dips in Al -Cu alloys; (1) - reduction of area, (2) temperature °C



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PRESNYAKOV, A.A. (Alma-Ata); STARIKOVA, G.V. (Alma-Ata); SAMOYLOV, V. A. (Alma-Ata); CHERVYAKOVA, V.V. (Alma-Ata)

Superplasticity of cast metastable eutectics. Izv.AN. SSSR. Otd. tekh. nauk. Met. i topl. no.2:146-147 Mr-Ap '61. (MIRA 14:4)

1. Institut yadernoy fiziki AN KazSSR.
(Nonferrous alloys—Metallography) (Eutectics)

NYSANBAYEV, G.N.; PRESNYAKOV, A.A.

Effect of the initial state on the properties of L59 and LS59-1 alloys. Izv. AN Kazakh. SSR. Ser. met., obog. i ogneup. no.3:79-84 '61. (MIRA 15:1)

(Brass--Metallography)

NYSANBAYEV, G.N.; PRESNYAKOV, A.A.

Effect of high speeds of crystallization on certain properties of L75 and LS74-3 brass. Izv. AN Kazakh. SSR. Ser. met., obog. i ogneup. no.3:85-90 '61. (MIRA 15:1)
(Brass--Metallography) (Crystallization)

VINNITSKIY, A.A.; PRESNYAKOV, A.A.

Limiting angles of grip in rolling. Izv. AN Kazakh. SSR. Ser. met., obog. i ogneup. no.3:91-94 '61. (MIRA 15:1)
(Rolling (Metalwork))

FRESNYAKOV, A.A.; VINNITSKIY, A.A.

Nature of slippage in rolling. Izv. AN Kazakh. SSR. Ser. met., obog. i ogneup. no.3:95-98 '61. (MIRA 15:1)

(Rolling (Metalwork))

PRESNYAKOV, A.A.; DUYSEMALIYEV, U.K.; CHERVYAKOVA, V.V.

Effect of small amounts of addition alloys on the serviceability of LS59-1 brass. Izv. AN Kazakh. SSR. Ser. met., obog. i ogneup. no.3: 99-104 '61. (MIRA 15:1)

(Brass--Metallurgy)

S/137/62/000/004/096/201
A052/A101

AUTHORS: Chernousova, K. T, Presnyakov, A. A.

TITLE: On the problem of ductility of copper-aluminum alloys. (A short report)

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 4, 1962, 25-26, abstract 4I150 ("Tr. In-ta yadern. fiz. AN KazSSR, no. 4, 1961, 9-14)

TEXT: The investigations were carried out on Cu-Al alloys melted in graphite crucibles out of the following initial materials: Cu of Mo grade and Cu-50%Al additional alloy to produce A-1 and AB 000 (AV000) (for the alloy with 12% Al) aluminum was used. Samples of 5 x 2 mm in diameter were tested on tension in a cast state at 100 - 800°C after a preliminary 15 minute exposure to the testing temperature. The Cu-12% Al alloy was tested in a cast state, in a hardened at 700°C state after a 40-hour exposure to this temperature, and in a diffusion-annealed state (40 hours at 700°C, 4 hours at 500°C, 8 hours at 200°C and furnace cooled). The strength of alloys decreases more slowly with the temperature in the case of low alloys. With an increase of Al content to 5-12% a sharp decrease of the strength is observed, with a transition through the

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S/137/62/000/004/096/201
A052/A101

On the problem of ductility ...

maximum at 300°C. The ductility reduces at the temperature of > 300°C and for most alloys it remains low up to 700°C; at temperatures over 500°C the ductility of homogeneous alloys increases with the increase of alloyage. The ductility of Cu-12%Al alloys increases sharply from 500°C upwards. A hardened alloy is characterized by a lower ductility value. A diffusion-annealed alloy up to 400°C has a zero ductility value, at 500°C some increase is observed and at 600°C a rabbling with the preceding reduced ductility zone takes place. A high ductility is connected with the transition through the temperatures of phase transformations $\beta + \gamma \rightarrow \alpha$, $\alpha + \beta' \rightarrow \alpha + \beta$ short heating, a 15 minute exposure to the testing temperature make possible to fix at the testing temperature a certain amount of metastable phase. With an increase of temperature β_1-phase decomposes at a high rate into $\alpha + \gamma'$.

M. Matveyeva

[Abstracter's note: Complete translation]

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S/135/62/000/004/095/201
A052/A101

AUTHORS: Presnyakov, A. A., Chervyakova, V. V., Kasymbekova, K. K.

TITLE: On the problem of the nature of ductility dips with aluminum alloys

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 4, 1962, 25, abstract 4I146 ("Tr. In-ta yadern. fiz. AN KazSSR, no. 4, 1961, 15-22)

TEXT: In order to establish a connection of ductility dips with diffusion processes, alloys of Al with 0.8, 2.6 and 4% Cu were investigated. The samples were subjected to static tension and ψ was determined as a function of the time of diffusion annealing, hardening temperature, duration of the exposure to different testing temperatures and the rate of heating. It is established that the aging causes the appearance of dips on the ductility curve. Only in the case of diffusion-annealed samples (during 168 hours at 520°C) and cooled at a rate of 3 degree/min no ductility dip was observed. Thus the disappearance of the dip is connected with the absence of aging with an alloy in the state of maximum equilibrium. In a hardened state the alloys prove to be most ductile and the dip in the region of 100°C is the least developed. An increase of hardening temperature from 250 to 350°C causes a sharp increase of ψ. On transition to

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On the problem of the nature ...

hardening temperatures of 500 - 570°C a further increase of ductility is observed. The effect of recrystallization was studied on Al-Cu alloys with 0.8, 2.0, 6.1% Cu and on silumins with 0.45, 1.1, 3.3, 6.7, 11.7 and 18% Si and also on commercial Al. After a cold deformation by 50%, hollow cylinders for X-ray diffraction study were turned of blanks. The back radiography was performed in the temperature chamber. The experiments were carried out up to 200 and > 300°C every 50° and in the range of 200 - 300°C every 20°. The radiograms were processed photometrically to determine the width and intensity of the lines. The beginning of recrystallization was determined from the emergence of isolated spots. In Al-Cu alloys the beginning of recrystallization was registered at 220 - 260°C, in the Al-Si system the beginning of recrystallization spreads over the range of 220 - 350°C. An increase of the Si content to 3.3% reduces sharply the number of spots. In the Al-Cu system a fairly good coincidence between the maximum intensity temperature of development of recrystallization processes with the zone of a sharp decrease of ductility characteristics is observed. In the case of silumins a shift over the temperature scale of the range of the most intensive development of the recrystallization process is observed depending on the composition. There are 11 references.

M. Matveyeva

[Abstracter's note: Complete translation]

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S/137/62/000/004/100/201
A052/A101

IP. D200

AUTHORS: Presnyakov, A. A., Chervyakova, V. V.

TITLE: On superductility of eutectoid Al-Zn alloys

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 4, 1962, 29, abstract 4I167 ("Tr. In-ta yadern. fiz. AN KazSSR", no. 4, 1961, 23-32)

TEXT: The changes of crystalline lattice accompanying the phenomenon of "superductility" were studied by the X-ray diffraction method. The radiograms were taken by Debye camera and in a camera with a flat cassette in Cu-Kα_1-radiation with Ni-filter. The radiograms were processed photometrically, the parameter was calculated from the 333 and 224 lines. The results of the measurement have shown that the lattice parameter of the β_1-phase of the Al-Zn alloy depends on the state of the alloy; its maximum value is registered with a freshly hardened alloy and the minimum one with a slow-cooled alloy. The main part in the origin of superductility in Al-Zn systems is played by the processes of the final stabilization of the metastable structure, which arises as a result of a spontaneous decomposition of β_2-solid solution. The phase lattices are

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highly distorted at a spontaneous decomposition of β_2-solid solution, which is probably the reason for a sharp decrease of solubility of components in a hardened alloy. There are 18 references.

M. Matveyeva

[Abstracter's note: Complete translation]

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A052/A101

AUTHORS: Starikova, G. V., Presnyakov, A. A.

TITLE: On the anomalous decrease of ductility of $\alpha + \beta$ brasses

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 4, 1962, 24, abstract 4I144 ("Tr. In-ta yadern. fiz. AN KazSSR", no. 4, 1961, 33-38)

TEXT: The part played by $\alpha \rightarrow \beta$ transformation in raising the plastic properties of Л 62 (L62), ЛС 59-1 (LS59-1) and Л 52 (L52) (β-brass) brasses was investigated. The value of δ at static tension in the temperature range of 600 - 900°C was taken as the measure of ductility. L62 and LS59-1 brasses have maximum δ values (~180%) at 870 and 740 - 770°C respectively. Pure β-brass (L52) has at the above temperatures a considerably lower value. Obviously the anomalous high δ values of L62 and LS59-1 brasses are due to an intensive process of phase transition $\alpha \rightarrow \beta$ taking its course at temperatures > 700°C, since the maximum δ value corresponds to the temperatures of the most intensive process of the α-phase decomposition. The connection between the α-phase decomposition and the anomalous ductility effect is confirmed by the change of δ with the change of exposure time of the samples at the testing temperature.

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On the anomalous decrease ...

The magnitude of the anomalous increase of δ is approximately proportional to the amount of the undecomposed surplus α-phase; in connection with this a decrease of the rate of heating leads to an increase of δ owing to the formation of alloys in a higher state of equilibrium. There are 10 references.

M. Matveyeva

[Abstracter's note: Complete translation]

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18.1200

AUTHORS: Starikova, G. V., Presnyakov, A. A.

TITLE: Investigation of ductility of β-brass

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 3, 1962, 19, abstract 3I119 ("Tr. In-ta yadern. fiz. An KazSSR", 1961, 4, 39-41)

TEXT: An investigation was carried out on the effect of phase transition on ductility of 2-phase brasses. The investigation was carried out upon specimens of brass Л-52 (L-52) in the cast state with a cross-section of 5 x 20 mm of the working part. Under static tension at temperatures of 300 - 600°C * one observes a sharp rise in ductility, and a drop in the resistance to deformation, which may be explained by a transition to an unordered state. In the region 570 - 600°C one observes a ductility rise connected, apparently, with diffusion processes occurring in the β-phase at these temperatures. There are 5 references.

M. Matveyeva

[Abstracter's note: Complete translation]
[* Editor's note: In the Russian original somethin seems to be missing at this spot.]

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PRESNYAKOV, A.A.; DAUTOVA, L.I.

Polymorphism of zinc. Trudy Inst.iad.fiz.AN Kazakh.SSR 4:42-47 '61. (MIRA 14:8)

(Zinc--Metallography) (Polymorphism)

S/137/62/000/003/119/191
A060/A101

AUTHORS: Presnyakov, A. A., Dautova, L. I.

TITLE: On the nature of cold brittleness of metals and alloys

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 3, 1962, 24, abstract 3I143 ("Tr. In-ta yadern. fiz. AN KazSSR", 1961, 4, 48 - 52)

TEXT: The article considers the literature data on the nature of cold brittleness of metals and cites data on the change in the ductility of Sn as a function of temperature and on the change in Zn strength as a function of temperature. It is pointed out that cold brittleness is observed in metals with a definite type of crystal lattice, however the fact of a metal belonging to a definite type of lattice does not determine its behavior at low temperatures. The transition of the metal to brittleness is caused by a re-arrangement of the structure, leading to a strengthening of the binding forces in the lattice and the rise in their directivity; it occurs in a temperature range whose width decreases as a function of the transformation kinetics from one structural state to another. The transition from plasticity to brittleness is, as a rule, preceded by a more or less considerable increase of plasticity in a narrow temperature

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On the nature of cold brittleness ...

region, caused by a preparatory stage of transformation. There are 30 references.

P. Zubarev

[Abstracter's note: Complete translation]

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S/137/62/000/005/087/150
A006/A101

AUTHOR: Presnyakov, A. A.

TITLE: On the causes of arising anomalous ductility in metal alloys

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 5, 1962, 33, abstract 5I185 ("Tr. In-ta yadern. fiz. AN KazSSR", 1961, v. 4, 53-62)

TEXT: On the basis of literature data and his own experimental investigations, the author discusses and analyzes regularities and anomalies in the changes of ductility of Cu-, Al-, Zn- and Mg-base metal alloys. The analysis is based on phase transformations and diffusion phenomena. There are 43 references.

M. Matveyeva

[Abstracter's note: Complete translation]

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S/137/62/000/003/137/191
A052/A101

AUTHORS: Presnyakov, A. A., Dautova, L. I., Klyuchnikov, Yu. F.

TITLE: On some peculiarities of changes in microhardness and crystal structure of brasses

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 3, 1962, 56, abstract 3I357 ("Tr. In-ta yadern. fiz. AN KazSSR," no. 4, 1961, 63-68)

TEXT: The changes in microhardness of brasses as a function of composition at hardening at different temperatures were investigated, and also an X-ray study of the crystal structure of alloys at higher temperatures was carried out. The microhardness of brasses containing 5 - 40% Zn was measured. The microhardness of alloys in a cast state and after hot deformation ($\sim$700°C) and annealing (4 hours at 600 and 800°C) was determined. On the microhardness curve of cast samples maxima are observed which indicate the presence of certain changes in the phase composition of alloys. A considerable decrease in the microhardness of alloys with $>$ 25% Zn after annealing is considered to be connected with the fixation of the smelt, that is with the hardening of the liquid. After deformation and annealing an ordering takes place in alloys, with the formation of a

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mixture of two phases. The annealing of brasses at a high temperature with a slow cooling leads to the fixation of the high-temperature state relatively unstable under usual conditions. The annealing of brasses at 600°C gives the most balanced state which is characterized by the lowest microhardness. At lower temperatures of a long-time tempering 2 groups of alloys undergoing certain changes are noted. Alloys Л 85 (L85) and Л 80 (L80) after tempering at 400°C during 4 hours display a sharp increase of microhardness. The microhardness of Л75 (L75) brass increases sharply after 4 hours' tempering at 500°C. In Л 95 (L95), Л 90 (L90) and Л 70 (L70) alloys no structure conversions take place, and their structure stabilizes after the 1st annealing. The X-ray study has confirmed that the equilibrium solid solutions have considerable fluctuations of the composition in individual blocks or groups of blocks. There are 14 references.

A. Rusakov

[Abstracter's note: Complete translation]